CLAIMS

What is claimed is:

1. A fuel cell system comprising:

a fuel cell stack for generating electrical energy;

a controller for controlling the operation of the fuel cell stack; and

an energy storage device coupled to the fuel cell stack for storing of electrical energy created during a shutdown mode.

2. The system of claim 1 wherein the fuel cell stack further comprises:

a fuel supply having a first set of upstream and downstream valves for supplying a fuel;

a oxidant supply having a second set of upstream and downstream valves for supplying an oxidant; and

wherein the controller closes the first and second valve sets in the shutdown mode.

3. The system of claim 1 wherein the energy generated in the shutdown mode results from the reaction of the remaining first fuel and the remaining second fuel in the fuel cell stack after the fuel cell system is shut down.

4. The system of claim 1 wherein the storage device is selected from a group consisting of a capacitor, a battery and combinations thereof.

5. The system of claim 1 further comprising:

a compressor;

a motor for powering the compressor; and

wherein the motor is coupled to the energy storage device for receipt of electrical energy therefrom.

6. The system of claim 1 further comprising at least one resistive heating plate coupled to the fuel cell stack, wherein the at least one resistive heating plate is coupled to the energy storage device for receipt of electrical energy therefrom.

7. The system of claim 2 wherein the fuel is a hydrogen feed gas.

8. The system of claim 1 further comprising:

a blower;

a motor for powering the blower; and

wherein the motor is coupled to the energy storage device for receipt of electrical energy therefrom.

9. A method for recovering energy during a shutdown of a fuel cell stack in which a first fuel supply and a second fuel supply are interrupted, the method comprising:

reacting a remaining fuel with a remaining oxidant in the fuel cell stack at shutdown to create electrical energy; and

storing the electrical energy for later use.

10. The method of claim 9 further comprising:

purging the fuel cell stack with air after storing the energy.

11. The method of claim 9 further comprising:

using the stored electrical energy to power a motor coupled to a compressor to facilitate the start-up of the compressor.

12. The method of claim 9 further comprising:

using the stored electrical energy to power at least one resistive heating plate to warm the fuel cell stack during a fuel cell start-up.

13. The method of claim 9 further comprising:

using the stored energy to power a component of the fuel cell system.

14. The method of claim 9 wherein the storage device is selected from a group consisting of a capacitor, a battery and combinations thereof.

15. The method of claim 9 further comprising:

using the stored electrical energy to power a motor coupled to a blower to facilitate purging of the fuel cell stack during start-up.

16. A method for purging a fuel cell stack after a shutdown of the fuel cell stack, the method comprising:

reacting a remaining fuel with a remaining oxidant in the fuel cell stack at shutdown to create electrical energy;

storing the electrical energy for later use; and

introducing air into the fuel cell stack to purge the fuel cell stack.

17. The method of claim 16 further comprising:

using the stored electrical energy to power a motor coupled to a compressor to facilitate the start-up of the compressor.

18. The method of claim 16 further comprising:

using the stored electrical energy to power at least one resistive heating plate to warm the fuel cell stack prior to a start-up.

19. The method of claim 16 further comprising:

using the stored electrical energy to power a component of the fuel cell system.

20. The method of claim 16 wherein the electrical energy is stored in a storage device selected from the group consisting of a capacitor, a battery and combinations thereof.